



HONOLULU
LA JOLLA
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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - JUNE 1978

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To our Readers:

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PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - JUNE 1978

STATUS OF PUBLICATIONS

Published

Smith, Paul E. 1978. Precision of sonar mapping for pelagic fish assessment in the California Current. J. Cons. Int. Explor. Mer. 38(1): 33-40.

A large scale sonar map of fish schools in the Los Angeles Bight is described and used to determine the amount of sampling required to estimate the number of schools at various levels of precision. About 8 nautical square miles (2744 ha) must be directly surveyed to get an estimate of fish schools with a 25% level of precision: 47 nautical square miles (16121 ha) must be sampled for a 10% level of precision using the observations and assumptions of this paper. Although spatial auto-correlation indicates independent observations can be taken at 5 nautical miles (9 km) spacing or greater, there is a possibility of exclusion or reduction of the number of schools at 7 to 15 nautical miles (13 to 28 km) range which should be further investigated.

Approved by Center Director

Dizon, Andrew E., and Richard W. Brill. Physiological thermoregulation in yellowfin tuna, Thunnus albacares. For publication in Physiological Zoology.

This report does not constitute publication and is for information only.

Leatherwood, Stephen, William F. Perrin, Vicky L. Kirby, Carl L. Hubbs and Marilyn Dahlheim. Distribution and movements of Risso's dolphin, Grampus griseus, in the eastern North Pacific based on collections and sighting records (1872-1975). For publication in the Fishery Bulletin, U.S.

Anglers Guide to Pacific Coast Published

In preparation for eight years, the "Anglers' Guide to the United States Pacific Coast" by Fishery Biologists James Squire, Jr. of the La Jolla Laboratory and Susan Smith of the Tiburon Laboratory was published this month by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service. The 171-page, soft-cover paperback volume provides general sources of information on the more frequently fished areas and the species of fish that are commonly caught along the U.S. Pacific coast, Alaska, and some of the Pacific Islands. The Guide is arranged in five sections according to similarities in their fisheries with Section I, Southern California; Section II, Northern California; Section III, Oregon and Washington; Section IV, Alaska; Section V, Pacific Islands (Hawaii, American Samoa, Guam).

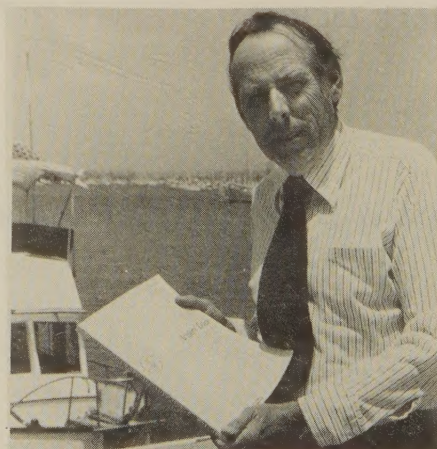
Each of the five sections contains a series of coastline fishing charts that outline offshore, bay and shoreline fishing grounds, and give locations of marine sportfishing facilities such as sportfishing boats, boat launching sites, fishing piers, skiff rentals, and jetty fishing sites. Accompanying the charts is a general description of each fishing chart and the common game fish that are found in that area. The guide also contains 237 illustrations by Smith of marine game fishes, together with a description of the fishes most commonly caught along the west coast and Pacific Islands.

Squire and Smith compiled the Guide with help from sportfishing boat and partyboat skippers and operators, interested sportfishermen and members of government agencies, both Federal and State.

The Guide may be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The stock number of the Guide is 003-020-00113-1; the price is \$7.50.



Susan Smith



James Squire

HONOLULU LABORATORY

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Economic Impact Analyses Continue for Billfish FMP and Monk Seal Critical Habitat Study

Several members of the Fishery Management Research Task continued work on a draft Fishery Management Plan (FMP) for Pacific billfishes and other pelagic species. Under the direction of Honolulu Laboratory Economist Dr. Michael Adams, Research Assistant Jim Cooper, and Statistician Gary Kamer assisted in analyzing and summarizing information from a recently completed statistical survey of the Kailua-Kona fishing community. Data on catch, effort, costs, earnings, and other items of interest to the Billfish Planning Team were gathered from owners and operators of charter fishing boats, non-charter vessels, and from charter boat customers. The results are being used by Adams and Dr. Roy Mendelssohn, Operations Research Analyst, to assess the economic impact of alternative billfish management policies in the Fishery Conservation Zone around Hawaii. Similar analyses are slated for American Samoa, Guam, and the Northern Mariana Islands.

Another Economist, Linda Hudgins, a doctoral degree candidate at the University of Hawaii is working under Adams' guidance to prepare an economic analysis of environmental impacts in connection with the proposed designation of a critical habitat for the Hawaiian monk seal. Among other things, this involves assembling available information on the commercial harvests of spiny lobsters and bottomfishes around the Northwestern Hawaiian Islands, where most monk seals are found and describing the recreational activities of military personnel on Midway Islands and other islands which may be affected by policies on the seal's critical habitat.

Observer Returns from Duty on First Foreign Vessel to Fish in United States FCZ around Hawaii

Thomas Kazama, Research Assistant, who served as a foreign fishery observer, returned to Honolulu from Tokyo where he disembarked from the Ryuyo Maru No. 2, a Japanese trawler which was the first foreign vessel to fish by permit in the United States Fishery Conservation Zone around Hawaii. The vessel was under charter to the Japan Marine Fishery Resource Research Center (JAMARC) to survey the north-central Pacific seamounts, particularly the southeast and northwest Hancock seamounts which lie within the United States FCZ. The Ryuyo Maru's catch included 407.1 metric tons (MT) of pelagic armorhead, Pentaceros richardsoni, and 3.7 MT of alfonsin, Beryx splendens. Because of the small trawlable area on the seamounts, the trawl hauls averaged 26.8 min per tow on southeast Hancock and 8.6 min per tow on northwest Hancock. The largest catch per

tow was 38.7 MT. Thirty-two trawl tows produced catches larger than 3 MT and 41 tows, catches less than 3 MT. There were 28 zero catch hauls.

In addition to collecting data on catch and effort, Kazama made observations on the morphology, food and feeding habits, and gonad condition of the armorheads; he also measured subsamples of the catch and collected otoliths for age and growth studies.

Activity Slows Down Around Fish Aggregating Devices

Walter Matsumoto, Fishery Biologist at the Honolulu Laboratory, noted that the entry of large, season skipjack tuna (25 lb) into the fishery has diverted the commercial fleet from the fish aggregating devices. During the month only 31,000 lb of skipjack and small yellowfin tunas were taken around the devices.

Matsumoto also reported that he has made arrangements for meetings in July with sport and commercial fishermen on Lanai and Maui to discuss the results and future plans of the fish aggregating devices program. In addition to Matsumoto, Laboratory Director Shomura, representatives from the Hawaii State Fish and Game, Sea Grant, and the Marine Affairs Coordinator's Office will be attending the meetings. Similar meetings will be held at a later date on Kauai and Hawaii.

Field Fish Identification Handbook Completed

Reginald Gooding, Fishery Biologist, and Bernard Ito, Research Assistant at the Honolulu Laboratory, completed the layout for a handbook entitled, "Field handbook of principal fishes of the central and western Pacific fishery management and conservation zone." The handbook contains descriptions and color photographs of 40 important fishes and sharks ranging from inshore bottom and reef-associated fishes to high-seas pelagic species. The purpose of the handbook is primarily to aid surveillance officials in identifying fishes they are likely to encounter while policing the United States FCZ in the central and western Pacific Ocean. The handbook will be bound in a manner that will allow the addition of more descriptions and photographs of fishes as the need arises. Only a limited number of copies of the handbook will be prepared for distribution.

Field and Laboratory Work Related to Northwestern Hawaiian Islands (NWHI) Study Continues

Personnel in the Insular Resources Task continued to process data and biological material collected on research cruises to the NWHI. Thomas Hida, Fishery Biologist, assisted by Laurie Sanderson and Alan Solonsky, University of Hawaii Marine Options Program (MOP) students, processed (sorting and identifying) fishes and other material collected in trawl hauls. Included in the material was a large specimen of a squid, tentatively identified as Symplectoteuthis oualaniensis. For

future biological sampling in the NWHI, Hida placed an order for the fabrication of ceramic octopus pots of two different designs.

Task personnel continued the observational program on commercial fishing vessels operating in the NWHI. Robert Humphreys, Research Assistant, returned from a fishing trip on the Easy Rider. Of interest are the juvenile snappers, Lutjanus kasmira, that Humphreys collected on the trip. The otoliths from these juvenile specimens should be useful in age and growth determinations of this species. Also in June Glenn Higashi, Research Assistant, departed on the Easy Rider on another trip to the NWHI and Darryl Tagami, Research Assistant, departed on the Libra also on a fishing trip to the NWHI.

Higashi and Tagami also worked on analyzing data and examining material collected on cruises to the NWHI. Tagami applied covariance analyses on standard-fork length and length-weight relationship and other data sets on demersal fishes caught in different seasons and various different banks. The results indicated that, in most cases, the data from fish caught in different seasons on various banks could be pooled. Higashi, assisted by Sanderson and Solonsky, began a study on the food habits of demersal fishes.

Research Assistants Jose Enitan and Jeffrey Sampaga continued reading otoliths of carangids; Bert Kikkawa, newly-hired Research Assistant, began familiarizing himself with otolith reading procedures.

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Gary Kamer, assisted James Uchiyama, Fishery Biologist, by writing a computer program that computes linear regressions on various data that are expected to consist of two or three separate regimes. By stating parameters which define the possible join points between adjacent regimes, it is possible to examine all likely combinations of regimes, their associated sum of squares and regression coefficients, and coordinates of the join points. Within each regime there exists at least squares solution.

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Howard Yoshida, Fishery Biologist, has nearly completed the task of editing the several rapporteurs' reports prepared at the December 1977 Pacific Billfish Stock Assessment Workshop. These will be sent to workshop participants for one last round of comments before final drafts are put together for general distribution.

Estimated Skipjack Tuna Landings Through June Dip Slightly Below Long-Term Average

The June 1978 Hawaii landings of skipjack tuna were estimated at 417 metric tons (MT), which is 36 MT above the landings for the same

period in 1977 and 329 MT below the 1948-77 long-term average for the same period. The cumulative landings from January through June were estimated at 1,644 MT, which is 245 MT below last year's landings for the same period and 186 MT below the 1948-77 long-term average for the same period.

FISH-ENVIRONMENT INVESTIGATIONS (FEI)

Unforeseen Events Frustrate Efforts of Researchers in Experimental Ecology of Tunas Task

June was a particularly frustrating period for research in the Experimental Ecology of Tunas Task in that experimental efforts yielded little in the way of substantive data, reported Dr. Andrew Dizon, Leader of the Task.

An experiment designed to examine thermoregulatory performance of skipjack tuna forced into high levels of activity at high ambient temperatures produced more mortalities than data. The experimental design included the use of plastic-coated lead weights which were forced-fed to skipjack tuna to induce them to swim at speeds above their minimum hydrostatic velocity. The idea was to force the fish to develop sufficiently high body temperatures at 26°C so that when the water temperature was raised to 30°C, the fish would be forced to reduce their body temperatures. They would not be able to reduce heat production by reducing their activity because of their artificially increased density (if they reduced speed they would lose lift and sink). In other words the fish would have to rely on physiological thermoregulation rather than behavioral thermoregulation.

Of 14 fish tested, 11 died before or just after the change to 30° C. Two of the remaining fish reduced their excess body temperature in response to the increase in water temperature but their swim speed dropped also. The remaining single fish (about 45 cm FL) proved quite adept at thermoregulating without resorting to reduction of swim speed. At 25° C ambient temperature, this fish swam at 96.3 cm/sec and maintained its body temperature 4.96° C above ambient; at 30° C ambient temperature, the fish swam just as fast (95.9 cm/sec) but its body temperature dropped to 2.95° C above ambient water temperature.

Another experimental endeavor resulted in no data whatsoever. During the month of May and June, much time was given to the preparation of equipment and computer programs by Dizon, Heeny Yuen, Leader, Recreational Fisheries Task, and Richard Brill, University of Hawaii graduate student, for a cruise on a small sportfishing boat in order to track large (50 kg) yellowfin tuna. The intent was to collect data on migration pathways, depth, and temperature distribution of free-swimming fish, and diel

activity patterns of yellowfin tuna. Extremely rough water very quickly immobilized the scientific crew and equipment and forced the termination of the planned 5-day cruise after 1 day. Plans are being made to re-schedule the experiment to July 3 to 6.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES PROGRAM

Data Acquisition System Designed for Jordan

Dr. R.M. Laurs, Leader of the Albacore Fisheries Program at the La Jolla Laboratory, with the assistance of Lt. M. Sullivan, NOAA Corps Officer, have completed design of the Data Acquisition System (DAS) planned to be placed aboard the research vessel Jordan during its forthcoming refurbishment. The DAS will be used to collect, log and display scientific and ship navigation and "housekeeping" data which are presently accomplished manually from various sources and locations on the ship. The system will serve as a computer controller and data management aid for both scientific and ship function needs. The design of the DAS, with the aid of Pacific Marine Center, has been developed to provide an integrated system which is versatile, powerful and easy to use with off-the-shelf components which are readily available for procurement.

A Hewlett-Packard 9845 calculator system will provide the control, computing, data logging and central display of the data collected. It will also provide the means to analyze the data collected. A CAMAC sensor interface system provides for the modular interface between the sensors (thermosalinograph, XBT, ship's navigation equipment, etc.) and the calculator. Remote CRT input/output terminals will be used by the ship's officers to enter and display navigation and other parameters and by the scientific personnel to interact with the calculator from locations on the ship remote from the calculator.

The selection of this system was based on a broad range of criteria including: 1) the use of industry standards for interfacing, 2) the use of simple BASIC computer language, 3) potential for future expansion, 4) compatibility with present CTD/HP 9825 system, and 5) flexibility in interfacing capability.

Sullivan and F. Kellenberger, Data Systems Manager, are presently seeking input from ship users to establish software requirements for the control, conversion, and formats of the multiple function monitoring.

PTDF Sponsored Exploratory Fishing Research Cruise Reports Outstanding Albacore Catches

This spring the Pacific Tuna Development Foundation (PTDF) arranged under contract, for jigboats to conduct a 90-day albacore exploratory fishing/research cruise in the western North Pacific in the vicinity of the Emperor seamount chain. Dr. R.M. Laurs, Leader of the Albacore Fisheries Program, reports that a cooperative arrangement has been negotiated in which the La Jolla Laboratory supplies fishing logs, XBT systems and probes, radio FAX recorders, and tagging equipment. The fishermen will take weather and ocean observations, record catches, and tag approximately 200 albacore per vessel. The logs and records will be delivered to the staff of the Albacore Fisheries program where data will be analyzed and a report written. R. Nishimoto, fishery Biologist, traveled to Honolulu, Hawaii and Seward, Alaska during May to aid in setting up operations.

One vessel left San Diego in early May, two left Honolulu in mid-May and the fourth left Seward, Alaska in early June. Preliminary reports indicate that the project is a success. Catches have been large and frequent. Repeated high scores of 300 to 400 fish per day have been reported with a high of 748 albacore. Most fish were caught between 38 and 41° N and 172 and 176°30' W. One non-charter boat has joined the group.

Ocean Profiler Operated Successfully on CalCOFI Cruises

R. Lynn, Oceanographer with the Albacore Fisheries program, reports that the conductivity-temperature-depth (CTD) ocean profiler interfaced with a microcomputer system has operated on a series of CalCOFI cruises with considerable success. K. Bliss, Oceanographer and NOAA Corps Officer Lt. M. Sullivan have set up the systems for easy training and operation by sea-going scientists and technicians. Bliss continues to monitor the data quality and Sullivan has visited the electronics group at the Pacific Marine Center (PMC) and the Northwest Regional Calibration Center, both in Seattle, Washington and the Scripps Institution of Oceanography instrumentation shops to set up procedure and policies for the Laboratory's own equipment calibration and maintenance. The only problem to date, according to Lynn, has been the infrequent loss of CTD signal that was traced to cable design. The National Ocean Survey (NOS) found this cable to be of marginal acceptance for use with the CTD. At Sullivan's suggestion, the Jordan's excessively long cable was cut in half. This action has apparently alleviated the problem.

NMFS Technicians Tag Albacore in Cooperative Research Project with AFRF

In a cooperative research project between NMFS and the American Fishermens Research Foundation (AFRF), Ron Dotson and Stephanie Revesz, Biological Technicians, have been assigned to the fishing vessel, Linda,

a 48-foot baitboat to conduct albacore tagging. The Linda left on June 22 on a AFRF 90-day charter to fish albacore on the fishing grounds southwest of San Diego, and north to San Francisco. Operations are expected to consist of 5 to 10 day cruises and 2-day port stops.

Dotson and Revesz are tagging albacore after injection each fish with oxytetracycline. The injection leaves an identifiable mark in the otoliths (earbones). The relation between otolith ring count and elapsed days between tagging and recapture is expected to be important in the development of techniques for aging albacore.

A reward of \$50 is given for the recapture and return of a "red-tagged" albacore.

Center Interest High in Application of Satellite-Derived Data to Fisheries Problems

The satellite-oceanography group of the Inter-American Tropical Tuna Commission (IATTC) is being disbanded because of the departure of its leader, Dr. Merritt Stevenson, and the dearth of contractual funding. Because of the increasing interest at the Southwest Fisheries Center in the potential value and applications of satellite-derived data to fisheries problems, IATTC has been given a one-year contract to transfer their programming, operational methodology and documentation to the Center. Half the support for this contract is being provided by NASA and NESS.

NOAA Corps Lt. D. McConaghy is working with the IATTC's R. Kirkham to effect this transfer and to document the programs and procedures. McConaghy and Kirkham report that the major programs have now been reviewed in detail and corrections and improvements have been incorporated. These programs are designed to analyze quantitatively detailed sea-surface temperature fields derived from NOAA satellite series sensors. In order to evaluate effectively the programs, they are being applied with the help of R. Lynn, to satellite overpasses taken in conjunction with CalCOFI cruises and with last year's albacore/oceanography cruises. Laurs and McConaghy have worked out an arrangement with NESS, Redwood City, to select IR and visual pictures when there are cloud-free conditions along the coast in the CalCOFI area. NESS then enhances the IR photos to bring out ocean features and sends us a copy of the photos. From these enhanced photos and from charts we receive on FOFAX here, we can request data tapes for those satellites passes that we wish to digitize and generate quantitative ocean thermal fields using the IATTC-developed software. We have already identified and received tapes for a number of cloud-free shots taken during CalCOFI cruises in December, February and March.

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A handbook, documenting the satellite sea surface temperature programs, has been written by McConaghy, Kirkham and M. Heinrich. The handbook will be maintained for future reference as an operator's manual for the processing of satellite data.

While compiling the handbook, several of the program procedures were modified to improve the accuracy of the temperature field. It is anticipated that further improvements will be obtained by reexamining the corrections made for atmospheric moisture.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION

Coverage of CalCOFI Pattern Most Extensive in Ten Years

The fifth of the 8 CalCOFI cruises scheduled for this fiscal year has completed by the end of June. Coverage of the CalCOFI pattern has been more extensive this year than in the past 10 years. With the NOAA research vessel, David Starr Jordan and the Alejandro de Humboldt, on charter to the Scripps Institution of Oceanography working the pattern, a complete and continuous suite of oceanographic and biological information has been obtained.

Fishery Biologist J. Thrailkill, working with six plankton sorters from the Scripps Institution of Oceanography insured that priority samples needed for the anchovy biomass estimate were completely counted for anchovy and other fish larvae, and the data entered into the CalCOFI data management system by June 15. Richard Charter, CalCOFI data manager was responsible for the final analysis and computer work. According to Dr. Lasker, Leader of the Coastal Fisheries Resources Division, the efforts in sampling and data processing which culminated in the anchovy biomass estimate were unprecedented with regard to its timeliness.

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Larry Eber, Oceanographer, has completed in draft form a series of oceanographic cruise reports from SIO cruise data which will be published in SWFC administrative reports. These will make available to SWFC scientists environmental data in a useful time frame. In the past, they have had to wait for as much as 2-3 years for this same information.

Evidence Indicates Important Anchovy Spawning Also Occurs in Autumn Months

Years of sampling eggs and larvae of the northern anchovy in the California Current have established that the spawning season is a winter-spring event with a mid-date of March 1. Four lines of evidence, however, show that important spawning also occurred in the autumn of 1976. These

were: 1) the sea survey of the California Department of Fish and Game by Ken Mais; 2) the anchovy daily growth ring project of Rick Methot, graduate student at the Scripps Institution of Oceanography; 3) the resonance frequency project of Paul Smith of the La Jolla Laboratory and Van Holliday of Tracor, Inc. (conducting research under a contract with NMFS), and 4) commercial fishing monitoring by John Sunada, California Department of Fish and Game and Gary Stauffer of the La Jolla Laboratory.

In the reports by Mais (CalCOFI Data Report, 1978; 1977), the 1976 year class is shown clearly from the early juvenile stage (50 mm, ca 3 months) to adult (123 mm, ca 20 months) as a well-defined modal progress in 10 successive cruises. In cruise 77A3 with a mid-date of February 20, 1977, there is another clear mode of anchovies near the end of the early juvenile stage (55-65 mm, ca 3-1/2 months). If the growth rate were similar to the main cohort of the 1976 year class their birthdate would be early November. If the autumn and winter growth rates were slower than the spring and summer growth rates, the birthdate would be earlier.

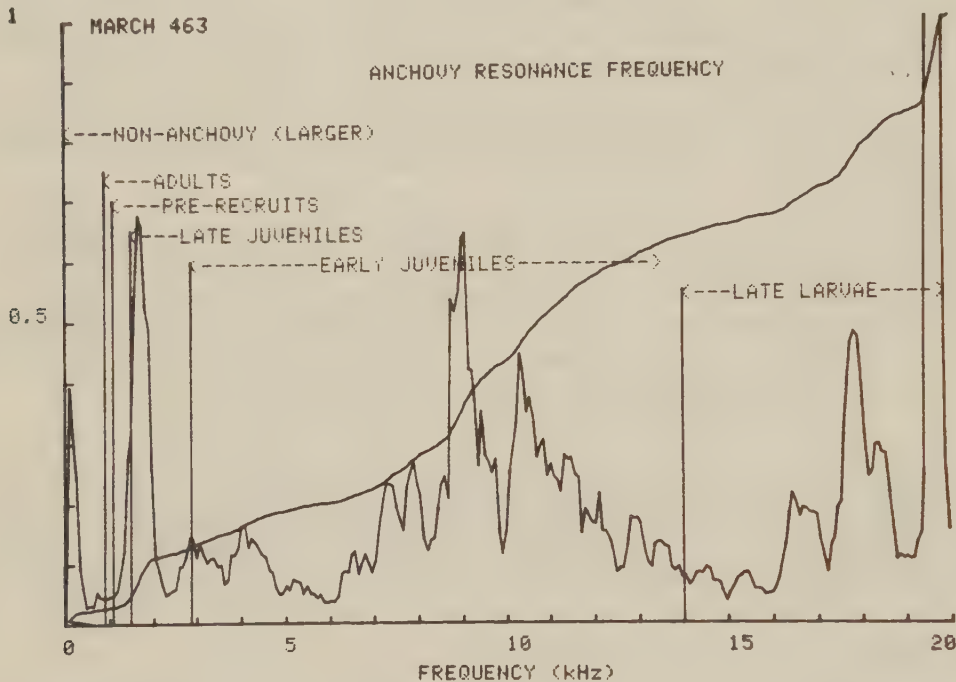
In an analysis of daily growth rings on the otoliths of late juveniles (75 mm, ca 8 months), captured in mid-September of 1977, Methot found distribution of birthdates of 29 fish distributed between December 1, 1976 and the second week of March 1977. Four of the fish (ca 15%) had birthdates before the beginning of the year and the mid-date was the last week of January 1977.

In the March cruise of the resonance frequency survey experiment, Holliday noted the predominance of resonant bubbles characteristic of late larvae (10-35 mm, 1/2 to 2 months old). In addition, the resonant frequency analysis (Figure 1) resolved some schools of fish with resonance responses characteristic of early juveniles (9 kHz, 50 mm, 3 months old) and late juveniles (2kHz, 90 mm, 6 months old). Birthdates on these fish might range from October 1976 through January 1977.

At the onset of the 1977-78 reduction fishery for the central sub-population of the northern anchovy, there were numerous larger fish with no annulus. By November 15, 1977, these fish which ranged in size from 91-127 mm (grand mean 108 mm) were assuming unprecedented importance in the fishery. At the normal time for recruitment of young-of-the-year into this fishery, mid-November, a cohort ranging from more than 80 mm to 98 mm entered the fishery. It is possible to interpret this as indicating an autumnal cohort from 1976 being aged as young of the year preceding the winter-spring cohort of the 1977 year class into the fishery a few months early.

Present cohort analyses from which vital estimates of spawning biomass are prepared assume a uniform birthdate for the anchovy of June 1. It appears from the preceding information that some anchovies of the year could be 9 months old by that date, a fact which would seriously affect subsequent estimates.

In other words, this extra spawning was actually a small additional group of fish which have been counted as the 1977 year class but were really not of the usual spawning.



COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

1978 Spawning Biomass Estimated for Central Subpopulation of Northern Anchovies

The 1978 spawning biomass of the central subpopulation of northern anchovies is estimated to be 1,304,000 short tons, according to Dr. G. Stauffer. The plankton sorting and data editing for the priority stations for the CalCOFI cruises 7801, 7803, 7804 and 7805 (essential information for making the estimate) was completed June 19, one week ahead of schedule. In general, the survey showed that the spawning intensity in the Southern California Bight and nearshore region is approximately the same as in earlier years but only about 1/3 of the range of central subpopulation contained anchovy eggs and larvae. Spawning was most intense during the March cruise. By the May cruise, spawning had fallen off considerably. In the winter quarter, 240 standard stations were occupied and 98 contained anchovy larvae. In the spring, 195 stations were occupied and 64 contained larvae. The number of occupied stations decreased in the spring quarter because the station pattern of the April Jordan cruise was modified mid-cruise so that priority stations south of the U.S.-Mexico border would be sampled.

The larva abundance estimates compiled by region quarter strata after Smith (1972) are 6704.1×10^9 and 4183.6×10^9 larva for the winter and spring quarters, respectively. These give a combined winter-spring larva abundance of $10,887.7 \times 10^9$ larvae. Expanding this value to an annual larva abundance gives $13,305.8 \times 10^9$ larvae. This converts to a 1978 spawning biomass estimate of 1,304,000 short tons using Smith's (1972) conversion factor of 9.8×10^{-8} . This is approximately 36% of the 1975 biomass estimate.

As specified in the Northern Anchovy Fishery Management Plan, optimum yield for 1978-79 season for the central subpopulation with the estimated spawning biomass of 1,304,000 short tons is 101,333 short tons. Of this amount, the optimum yield in U.S. zone is 70% or 70,933 short tons. A total of 12,600 tons is reserved for U.S. non-reductive fishing. The 1978-79 reduction quota is 58,333 short tons of which 5,833 tons are reserved for the fishery north of Pt. Buchon and 52,500 short tons are available for the U.S. fishery south of Pt. Buchon.

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Keith Parker, Statistician, has been developing two methods for estimating spawner biomass in non-CalCOFI years with both methods relying upon age class strength data. Currently, the data from mid-water trawl surveys is being coded and punched on computer cards.

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During the past year, work on the Anchovy Fishery Management Plan and related issues preempted work that was previously in progress. A temporary lull in June allowed progress toward completion of some manuscripts. Among these, a paper entitled "Population estimates for the waning years of the Pacific sardine fishery" was completed by Alec MacCall and sent to the CalCOFI Reports editor. Also, a literature review of the historical development of catch-per-unit effort as an index of abundance is about one-half completed.

UC Santa Cruz Student on Sea Grant Traineeship at La Jolla

Greg Potorff, a student in economics at UC Santa Cruz, will be at the La Jolla Laboratory during the summer. He is funded by the Sea Grant traineeship program and will be working with Economists Dan Huppert and Jane McMillan.

LARVAL FISHES, COASTAL EAST PACIFIC

Sex Ratio and Incidence of Spawning Determined From Histological Analysis of Gonads

The sex ratio of northern anchovy schools is known to vary markedly from schools composed of nearly all males to ones composed of nearly all females. Variability in sex ratio is most marked during the spawning season which is the reason Dr. J. Hunter, Fishery Biologist, decided to examine how spawning activity was related to sex composition of schools as a part of the study on frequency of spawning in anchovy.

Twenty-five fish from each trawl sample taken in February 1978 were sexed by K. Mais of the California Department of Fish and Game. These samples were grouped into three classes on the basis of sex ratio (number of females/25) and the proportion of females that fell within the following reproductive classes was calculated for each sex ratio class: spawning on the night of capture; spawning on the night before capture; and no evidence of spawning.

The proportion of females spawning on the night of capture increased as the proportion of males in the trawl sample increased. In samples containing mostly males (mean sex ratio 0.25) nearly 40% of the females spawned on the night of capture whereas in samples containing mostly females (mean sex ratio 0.84) only 10% of the females spawned and in samples which contained about equal number of males and females, 16% spawned. A chi-square test indicated that these proportions differed from a random distribution. Thus, on a relative basis most spawning occurred in male-dominated schools, but females that had spawned on the previous night occurred in about equal proportions in all schools regardless of sex ratio. It is of interest that some reproduction takes place even in schools dominated by females. The relation between sex ratio and school size is unknown. If we assume that school size was the same regardless of sexual composition then about 55% of the females occurred in female dominated schools (class sex ratio range 0.70-0.99), 36% in schools of roughly equal sexual composition (range 0.40-0.69) and only 9% in schools dominated by males (range 0.39-0.10). This calculation indicates that if school size did not vary with sex ratio, egg production per school per night would be about the same regardless of sexual composition because the absolute number of spawning females per school would be about the same.

Study Completed on Preservative Shrinkage of Larval Fish

Fishery Biologist G. Theilacker has completed a study of preservative shrinkage of larval fish. In order to relate laboratory larval fish studies to the field, it is necessary to compare animals at the same developmental stage; larval fish length is the criterion usually used to

describe age. Most field studies rely on length measurements of net-captured, preserved fish larvae and laboratory studies also report results in preserved (and live) measurements. Theilacker found from this study on northern anchovy larvae that the main determinant of the amount of shrinkage is the method handling larvae prior to preservation. Laboratory-sampled larvae (pipetted directly into preservative) shrink less than field-collected larvae (netted first and then preserved). Also, amount of shrinkage increases with increased handling time, and shrinkage per unit time is related to larval size (small larvae shrink more than large larvae).

Four asymptotic, size-related shrinkage curves have been fitted to the data by J. Zweifel, Mathematician at the La Jolla Laboratory, for 5, 10, 15, and 20-minute net-treated larval fish lengths (before preservation). J. Metoyer, Biological Technician, has just completed measuring the net-treated and laboratory pipetted preserved larvae, and the final shrinkage curves will be calculated. These curves, for 3-50 mm anchovy, will compare live length, laboratory-preserved length, net-treated length for four-time intervals, and preserved-net-treated (i.e., "field-collected") length.

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Theilacker is also continuing to study the histological and morphological characteristics of feeding and starving larval fish. These characteristics will be used as indicators to estimate larval fish starvation in the sea and ultimately to estimate survival. The analysis of larval jack mackerel morphometric data, as related to feeding history (diet, delayed feeding, intermittent feeding, starvation) and egg size, is nearly completed. Seven different groups of larvae are being compared simultaneously with a multivariate morphometric technique. The analysis is correctly classifying an average of 60% of the larvae into each of the seven groups. Percentages are higher (70-80%) in the "always fed" and "always starved" groups. A histological examination of each of the above larvae in the seven groups (total = 450) is in progress. The sensitivity of the morphological analysis will be compared with the histological analysis.

Study Continues on UV Effects on Anchovy Larvae

Dr. John Hunter, Fishery Biologist, reports that with Dr. John Taylor, Sandor Kaupp and Beverly Macewicz, they have completed the first half of the 6-month study on UV effects on anchovy larvae. To date they have completed three 1-day exposure experiments on anchovy eggs and larvae in the Center's aquarium facility using artificial sources of UV-B.

This work indicates that the total cumulative dose of UV-B for 11 days that produces a 50% mortality is about $700 \text{ (J}\cdot\text{m}^{-2})_{\text{DNA eff.}}$. The cumulative dosage for 11 days is somewhat below that producing 50% mortality after 4 days, $1100 \text{ (J}\cdot\text{m}^{-2})_{\text{DNA eff.}}$. This means that the effect of longer exposures was to lower the total cumulative LD 50 and, of course, the

difference is much greater on a daily basis. These results indicate that anchovy eggs and larvae live close to their natural tolerance. Our routine measurements of solar UV-B indicate that the daily incident dose in La Jolla in June varies from 160-200 ($\text{J}\cdot\text{m}^{-2}$)DNA eff. whereas the LD50 for 11 days is equivalent to a daily dose of about 64($\text{J}\cdot\text{m}^{-2}$)DNA eff.

Dr. Hunter reports that he plans to continue the aquarium work to obtain sufficient numbers of points to confidently estimate the LD50 for 11 days exposure with fiducial limits and to continue routine monitoring of solar UV-B. It is intended to begin experiments in the roof-top facility at the Center using only solar UV-B and to start histological and morphological examination of specimens surviving various dosages of UV-B.

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Dr. R. Owen, Fishery Biologist in the Coastal Division, traveled to the national meetings of the American Society of Limnology and Oceanography in Victoria, B.C. where he presented a paper, "Microdistribution of biogenic particle concentrations in coastal waters," describing results of his sampling of biological substances and nutrients at extraordinarily small intervals (20 cm) in the mixed layer and density-stratified layer off southern California.

Microlayers are evident in motile and non-motile phytoplankton, small zooplankton, detritus and nutrients and is partly accounted for by purely physical processes. Variations in concentration of these substances suggest that the ocean at rest is quickly divided into microniches of less than one meter in extent by phytoplankton and that the smaller zooplankton (at least those sampled well by Owens' apparatus) respond in kind.

Thus an ocean region not only may contain higher local concentrations of larval fish food than previously thought but can also sustain more types of organisms through reduction of competition by centimeter-scale spatial allocation of limiting resources.

MULTISPECIES TAXONOMY PROGRAM

Progress Continues on Rearing of Coastal Fish Species

Dr. G. Moser, Leader of the Multispecies Taxonomy Program, reports that the coastal fish rearing project continued to produce life history series of target species. Complete series from eggs to juveniles were obtained for the black croaker, Cheilotrema saturnum, and the spotfin croaker, Roncador stearnsi. A series of the queenfish, Seriphus politus, was reared for age determinations by otolith growth increments. The otoliths were read by Carl McLemore. An interesting finding is that daily growth increments begin to form when the eyes become fully pigmented, two days after hatching.

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Dr. E. Ahlstrom, Senior Scientist, has made considerable progress on his study of the higher classification of flatfishes based on characters of larvae and adults. This is, in essence, a world-wide revision of the major groups of flatfishes that has resulted in the preliminary establishment of a new family for Citharichthys and three closely related genera.

CalCOFI Water Samples Analyzed for Distribution
of Larval Anchovy Food

Dr. Lasker reports that the CalCOFI cruises have provided him with water samples from the Southern California Bight which he is using to analyze for the distribution of larval anchovy food. Particle counts with the Coulter Counter and microscope counts of the individual phytoplankton have been completed with the help of A. Dodson, Biological Technician. These show that the storms which swept across the California Current throughout December, January and February, effectively kept the water in turbulent condition, well mixed, and the potential larval anchovy food very dilute. By mid-March, the ocean had calmed down, stratification had begun, and first-feeding anchovy larvae from mid-March through June appeared to have an ample supply of food inshore. Gymnodinium splendens, a species of dinoflagellate known to support growth in first-feeding anchovy larvae, was prevalent at some of the inshore stations. Subsequent cruises should provide information on the persistence and distribution of this important phytoplankton species. The restricted distribution of anchovy larvae in the California Current this year, as compared to previous years and the late appearance of food concentrations suggests that further analysis needs to be done before any predictions can be made on the degree of recruitment resulting from this year's spawn.

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On June 29, Dr. Lasker traveled to Long Beach to attend a meeting of the Marine Research Committee of the State of California. He reports that several projects will be supported by the MRC in FY 1979. Among these are: "Assessment of spawning biomass of anchovy central stock using spawning incidence" and "Determination of spawn date and growth rate of anchovy pre-recruits spawned in CalCOFI year 1977-78." The MRC will also underwrite a portion of the funds needed for plankton sorting at the Center in the upcoming year.

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Dr. R. Lasker attended a workshop in Seattle, Washington on June 15 and 16 at the Pacific Marine Environmental Laboratories (PMEL) to discuss pollution. The topic of the workshop was "Nutrient Enrichment and its Effects on the Marine Biota." He is scheduled to attend a meeting sponsored by the Environmental Research Laboratories (ERL) at Estes Park, Colorado, in July to elaborate on this topic. The result of the Estes Park workshop will be a Program Development Plan (PDP) for all of NOAA on pollution in the marine environment.

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During June, Dr. Angeles Alvarino and Dr. Paul Smith both lectured to the zooplankton course sponsored by CICESE (Centro de Investigacion Cientifica y Educacion Superior de Ensenada, B.C.). Dr. Alvarino discussed chaetognaths, medusae and siphonophores. Dr. Smith distributed his newly-produced FAO manual entitled, "Standard techniques for pelagic fish egg and larva surveys" to the class and later gave practical demonstrations aboard the Mexican research vessel Humboldt. Dr. Enrique Carillo, Convenor of the course, complimented the speakers on their presentations.

In July, Drs. E. Ahlstrom and G. Moser are scheduled to present lectures for a week on the identification of fish eggs and larvae.

Oceanic Fisheries Resources Division

TUNA RESOURCES PROGRAM

Sampling of U.S. Seiners Continues in Puerto Rico

Through contract arrangements with the Inter-American Tropical Tuna Commission, the La Jolla Laboratory receives data on the catch of Atlantic tunas caught by the U.S. purse seine fleets off West Africa. Log book data and length measurements are being collected at landing ports in Puerto Rico. Thus far this year, five length frequency samples have been collected from a catch that was recently landed. The samples indicate that larger yellowfin tuna (124 to 150 cm) were caught farther offshore than smaller yellowfin tuna (53 to 82 cm). This is a pattern that has been reported for other yellowfin tuna fisheries.

Team Begins Work on Billfish Management Plan

A working draft of the eastern Pacific portion of the Billfish Management Plan was prepared by the Pacific Council's Billfish Management Plan Team consisting of G. Sakagawa and J. Squire representing NMFS, and Robert Bell of the California Department of Fish and Game. Progress was also made on preparation of the Management Plan for oceanic sharks. This plan will be incorporated in the total Billfish and Oceanic Shark Fishery Management Plan at a later date.

On June 30 a meeting was held at the Center to discuss the working draft of the Billfish Plan with members of the Pacific Fishery Council's Billfish Advisory Sub-Panel. The four members of the Advisory Subpanel present were: Tod Ghio of Anthony's Seafood, San Diego; Fred Hepp, commercial fisherman from Santa Barbara; Bud Sears, commercial fisherman from San Diego and Ed Martin, sport billfisherman from Santa Ana. Martin was nominated for chairman of the Panel and Squire assumed the chairmanship of the Billfish Management Plan team, formerly held by Bell. Bell will remain active on the team; however, because of personal reasons he had asked to be relieved of the chairmanship responsibilities.

The working draft of the Plan was reviewed by the Team and Panel members.

Tuna Vessel Participation in
FAX Advisory Program

During June 1978, 18 tuna seiners contributed synoptic weather and XBT (expendable bathythermograph) data to the NMFS FAX Advisory Program. A total of 136 weather observations and 14 XBT observations were reported. The number of participating vessels and reported weather observations for June, 1978 were the lowest of the 4-year series, 1975-78 (Table 1). Total observations for the year, however, is ahead by 2% for weather observations and 117% for XBT observations from the same period in 1977.

Table 1

MONTH OF JUNE				
	1975	1976	1977	1978
Number of vessels with equipment	75	74	58	52
Number of vessels reporting	34	22	29	18
Number of weather observations reported	222	182	361	136
Number of XBT observations reported	63	11	28	14
Monthly observation total	285	193	389	150

Table 2

JANUARY TO JUNE TOTALS				
	1975	1976	1977	1978
Number of weather observations reported	1611	1401	999	1020
Number of XBT observations reported	350	153	60	130
Observation total	1961	1554	1059	1150

The Santa Rosa leads the list of program participants this month with 29 weather observations and 5 XBT observations radioed to Commerce-licensed radio station WWD. NMFS extends its congratulations to Captain John Gomes and the crew of the Santa Rosa as top boat of the month.

A cordial welcome to the tuna seiner, Top Wave, owner Tony Trutanich, Captain Tony Santos and his crew who are first-time participants in the NMFS FAX program this month.

Biological Sampling of Foreign Imports of Atlantic Tuna Continues in Puerto Rico

Atlantic-caught tuna transhipped to Puerto Rico are sampled routinely for data on fork length, weight and species composition by Biological Technician Eugene Holzapfel of the La Jolla Laboratory.

Results of sampling during the period January through June 1978 are as follows:

Species	Gear	No. of Samples	No. of Fish Sampled	Tonnage Sampled (MT)
Yellowfin	Baitboat	13	625	822
	Purse Seine	3	147	84
	Unknown			
Skipjack	Baitboat	9	451	2151
	Purse Seine	1	50	529
	Unknown			
Bigeye	Baitboat	10	442	273
	Purse Seine	2	61	28
	Unknown			
Albacore	Longline	2	100	662
TOTAL		40	1,876	4,549

This sampling program is part of an overall effort by member nations of the International Commission for the Conservation of Atlantic Tunas of which the U.S. is a member, to collect statistics on the catch of Atlantic Tunas for use in stock assessments and fishery evaluations.

Final 1977 Statistics on U.S. Tuna Fisheries of the Atlantic Ocean Submitted to ICCAT

Atlantic tuna statistics for the United States are collected on a regular basis by units of the National Marine Fisheries Service, including the Southeast Fisheries Center, Southeast Region, Data Management and

Statistical Division (Washington, D.C.) and the Southwest Fisheries Center (SWFC). Twice a year the statistics from the previous year's fisheries are assembled by staff members of the Tuna Resources Program of the SWFC for submission to the International Commission for the Conservation of Atlantic Tunas (ICCAT). The statistics include total catch by species, catch and effort by fishery, and biological measurements. These statistics are published by ICCAT and serve as a valuable source of information for stock assessment and fishery evaluation and for guiding the 18-member organization in fulfilling its purpose of conservation of Atlantic tunas and tuna-like species.

The second installment of United States fishery statistics for 1977 was submitted to the ICCAT Secretariat in June, according to Dr. William Fox, who serves as U.S. statistical correspondent for ICCAT. The statistics reveal that in 1977 the U.S. commercial catch of Atlantic tunas and tuna-like species was approximately 24,800 MT, up by approximately 40% from that of 1976. Tropical tunas (yellowfin-skipjack) lead the list with 13,400 MT; followed by mackerels (Spanish and king), 9,200 MT; bluefin tuna, 2,000 MT and others, 100 MT.

Virtually the entire U.S. Atlantic catch of tropical tunas was made by the distant-water purse seine fleet. Approximately 93% of the total catch was made in the eastern Atlantic, off Africa. The number of seiners participating in the fishery was up by 60% over that of 1976 (Figure 1), and the catch was up substantially by about 260%. Fishing, however, was average and not unusually good or significantly different from that of 1976 as judged from the catch rates (Figure 2).

United States commercial catches of Spanish and king mackerels are primarily landed in Florida. The annual catch has been quite stable at 4,000-6,000 MT for Spanish mackerel and 2,000-4,000 MT for king mackerel over the last decade. The catches in 1977 were lower than in 1976 by about 10%.

Atlantic bluefin tuna are taken by United States commercial fishers in the northwestern Atlantic from about North Carolina to Maine. In 1977 the U.S. fishery landed approximately 2,000 MT of bluefin tuna, unchanged from the amount landed in 1976. The fishery was restricted with quota, size, gear and area-time regulations, which are intended to prevent further depletion of the resource and conforms to guidelines adopted by ICCAT.

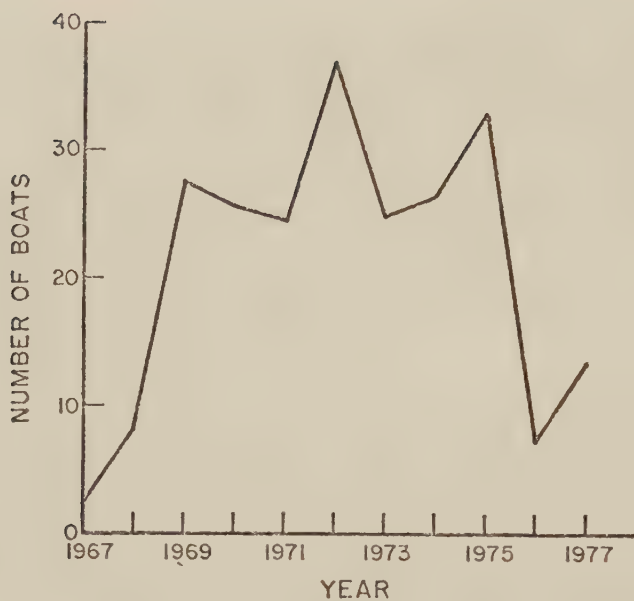


Figure 1. Number of American purse seiners that participated in the eastern Atlantic tropical tuna fishery.

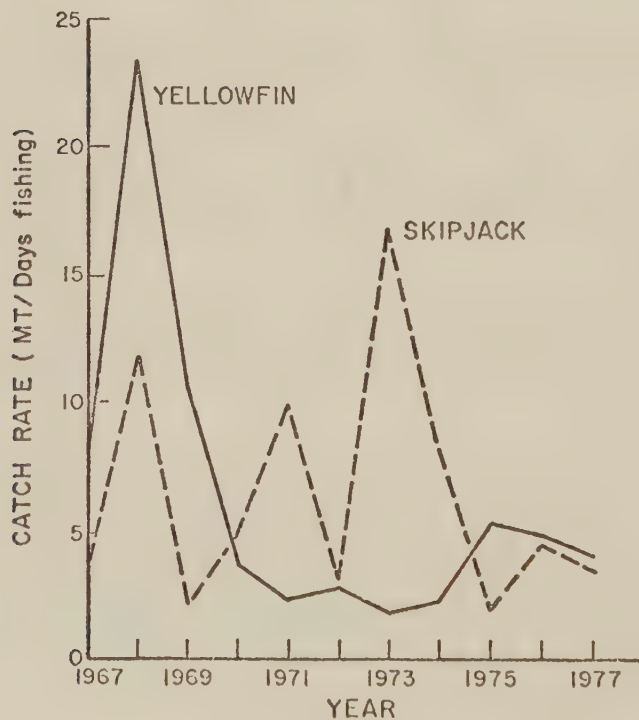


Figure 2. Catch rates of American tuna purse seiners that participated in the eastern tropical Atlantic tuna fishery.

MARINE MAMMAL ASSESSMENT & MONITORING PROGRAM

Staff-Scientists-Present-Papers-at-Workshop on Stock Abundance Estimation

The Stock Abundance Estimation Workshop presented by the Southern California Chapter of the American Institute of Fisheries Research Biologists in San Clemente on June 6 was attended by Drs. Nancy Lo, Rennie Holt, David Au, Joseph Powers and Bruce Wahlen of the Marine Mammal Assessment and Monitoring Program. Papers were presented during the workshop by Lo and Powers.

Lo's presentation focused on the estimation of incidental catch with the porpoise mortality issue as an example. In her discussions she covered sampling and stratification of sampling of fishing fleets, various types of ratio estimators, the choice between ratio estimators, and the effect of year-to-year changes in the distributions of the estimators. She also discussed the effects of sample size on precision and how they are both related to variation in estimators.

Powers' presentation was on the estimation of abundance using line transect theory with applications to aerial surveys. He presented the theoretical basis for using line transect estimation methods and some practical solutions for producing estimators. Suggestions included parametric methods, i.e. fitting data to known distributions such as a negative exponential, as well as non-parametric methods of fitting, such as Fourier series analysis. The relation of line transect assumptions to aerial survey work was discussed in some detail.

Progress on Ecosystems Analysis Contract Reviewed

Dr. George Innis of Utah State University visited the La Jolla Laboratory on June 8-9 to present information on progress made on an ecosystems analysis modeling contract. Innis was accompanied by co-workers Drs. James Haefner, Charles Fowler, and Gary Worthen. The first stage of the review included a step-by-step presentation of each of the submodels: abiotic chemistry, forage, and predatory-prey. The objectives of the models, the assumptions, and the hypotheses posed by the models were each delineated. Problems associated with parameterization and implementation were also discussed. Criticisms and suggestions for improvements were made at this time by Division Chief W. Fox and others.

The second stage of the review was a discussion of the various suggestions and options and selecting those which could be implemented.

The model will be run on a grid of 5° squares, including that portion of the water above the thermocline and events within the daily time-step. The base submodel is the abiotic-chemical model. Presently, temperature, flow rates, the depth of the thermocline and light are the driving functions. Nutrients (NO_3 and PO_4) are accumulated in the water and are moved with the water via the current equations. Problems with parameterization have caused the water balance to be unequal between adjacent cells. The suggested solution is to distribute the imbalance among the adjacent cells. Another modification to the submodel will be inclusion of land run-off inputs.

The forage submodel includes phytoplankton, stages of copepods, myctophids, anchovies, crabs, cephalopods, and epipelagic fish. Suggestions to improve this submodel were: 1) include euphausiids, 2) include the categories of small and large myctophids, cephalopods and epipelagic fish as reproducing entities rather than the small being an earlier life stage of the large, and 3) myctophid movements should not simply be driven by the currents.

The predatory-prey model assumes no association of tuna and porpoise in movement from cell-to-cell. Some modifications to the prey lists were suggested and will be implemented. Other modifications will be an "other" porpoise category (either as a separate group or subsumed in existing similar groups), a bird category, and baleen whale and toothed whale categories (to replace killer whales).

Various other modifications were suggested. However, many of these are hypotheses that can be tested in the exercise of the model. Whether tuna and anchovy migration is food-directed; whether the forage component could be eliminated in the model, i.e. could causality be explained in a direct line from abiotic to top carnivores; and the effect of implementing a density-dependent function of porpoise production in relation to tuna are all questions which will be addressed using the model.

According to Dr. Powers, Leader of the Marine Mammal Assessment Program, the review was a productive process in that misconceptions were removed and additional information provided. The Utah State group is taking a conservative approach by objectively providing the detail in structure needed to implement a food-chain ecosystems model, but not forcing the causality by assuming too much detail. This will allow modification of the model to test hypotheses on a step-by-step basis. The testing activity is best done in-house by people who have become familiar with the model as was the original intent of the contract.

MARINE MAMMAL BIOLOGY & TECHNOLOGY PROGRAM

Program Leader Participates In International Whaling Conferences

Dr. William Perrin, Leader of the Marine Mammal Biology and Technology Program, was on travel status during June, first attending the Scientific Committee meetings of the International Whaling Commission in Cambridge, England. Perrin participated primarily in the Small Cetacean and the Sperm Whale Committees as well as tabling a paper of the southwestern stocks on spotter and spinner dolphins. An interesting outcome of the meeting is the increased awareness of the Turkish take of dolphins in the Black Sea. The kill is estimated to be in the tens of thousands.

Perrin then proceeded to Brno, Czechoslovakia to take part in the Second International Theriological Conference where he presented a paper on the "Zoogeography of dolphins in the tropical Atlantic."

In July, Perrin planned to travel to the Soviet Union for meetings of the US/USSR Marine Mammal project.

Dedicated Vessel Completes 50-Day Cruise to Examine Porpoise School Structure - Departs on Third Cruise

The dedicated research vessel, Queen Mary, returned to San Diego on June 5 after a 50-day cruise directed primarily to the examination of schools of porpoise for determination of age and sex structure. Twenty-two sets on porpoise were made, four of which involved the use of the Porpoise Impoundment System which basically consists of a sea corral and examination chutes. This apparatus was connected to the back-down area of the commercial tuna seine. More than 400 porpoise were examined. This system will be used again on Cruise IV, scheduled to leave San Diego on September 6 when it will be used for tagging studies as well as biological examination of porpoise schools.

Other studies conducted during this cruise were gear research emphasizing net dynamics and herding devices and pathological studies conducted by William Walker under contract to the National Marine Fisheries Service. Participating in the cruise from the Southwest Fisheries Center were Jim Coe, Jackie Jennings, Warren Stuntz, and Jim Lambert.

Dedicated Vessel, Queen Mary, Departs on Third Cruise

On June 22, the Queen Mary, departed San Diego on Cruise III. Cruise III is planned for two legs of 30 days each with a change of scientific crew in Puntarenas, Costa Rica.

With the U.S. Tuna Foundation representing the industry, the National Science Foundation, National Marine Fisheries Service and the Naval Ocean Systems Center are also contributing to the funding of research for this third cruise. Scientists on this cruise are from the NMFS, Naval Ocean Systems Center, San Diego State University, Hubbs-Sea World Research Institute, Sea Life Park, and the University of Hawaii.

Dr. Frank Awbrey of San Diego State University is the Cruise Leader on the first leg. Research on this leg will focus on the development of alternative fishing systems and further experiments testing bioacoustical methods to reduce porpoise mortality. In addition to Awbrey, other scientists aboard for the first leg include: Dr. William Evand of the Hubbs-Sea World Research Institute, Dr. Scott Johnson of the Naval Oceans Systems Center, Dr. Wesley Parks, Living Marine Resources and Thomas Duffy and Gordon Sanford of NMFS.

On the second leg the Cruise Leader will be David Bratten of NMFS who plans to test olfactory attractants on tuna, study porpoise behavior and the physiological correlates of chase and capture of porpoise. In addition to Bratten, those participating on the second leg will be: Karen Pryor, Ingrid Kang, Walter Ikehara and Andrew Britton, NMFS contractors and Philippe Vergne, Living Marine Resources.

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Wildlife Biologist Al Myrick traveled to the Smithsonian Institution in Washington to collect data and to measure museum specimens for completion of his doctoral dissertation which deals with the morphology and functional anatomy of dolphins. On June 14, Myrick delivered a paper on the tuna porpoise problem: data collection, stock assessment, and biological studies to the American Society of Mammalogists meeting in Athens, Georgia.

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Dr. Warren Stuntz, Wildlife Biologist, reports that the Regina Maris, a 144-foot barkentine, was awarded the contract to study the behavior of porpoise in the eastern tropical Pacific undisturbed by tuna seiners or other power vessels. The cruise, under the scientific direction of Stuntz, is scheduled to leave Panama City on July 27.

Experimental Porpoise Tagging Conducted

Jackie Jennings, Fishery Biologist in charge of the porpoise tagging work at La Jolla reports that preliminary freeze branding experiments using liquid nitrogen were carried out on a laboratory pig in San Diego before proceeding to Hawaii to work on Hawaiian spinner dolphins were tagged and two were serially freeze branded using liquid nitrogen and Freon 22. These experiments are being conducted in preparation for a large-scale dolphin tagging project.

In addition to Jennings who directed the experiments, also taking part were Walt Gandy and Dave DeBlanc of the National Fisheries Engineering Laboratory in Bay St. Louis, Rusty White of the Hubbs-Sea World Research Institute, Dr. Keith Farrell of Washington State University and Dr. Ed Shallenberger and Ingrid Kang of Sea Life Park. All of the latter are under contract to NMFS for the tagging project.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Fish Morphology Provides Ecological Insights, Studies Show

The morphology of a fish reflects its behavior and other features that determine its ecology. Despite the general acceptance of this fact, there has been little evidence that management recognizes it as a valuable tool in developing strategy. Current studies by Fishery Biologists Peter Adams and Tina Echeverria at the Tiburon Laboratory attempt to define certain ecological types among rockfishes that are based on key morphological features.

Adams has presented evidence that rockfish fisheries depend most heavily on species of particular ecological types that have certain morphological features in common. They are relatively large, abundant fishes that aggregate above the sea floor. Each has a relatively compressed, fusiform body with a tail fin that is at least moderately incised. Their head spines are reduced and their mouths are relatively large. He points out that two species with these features - the chilipepper (Sebastes goodei) and the bocaccio (S. paucispinis) - dominate the fishery off California and Oregon, while northward, off Washington and beyond, the fishery is dominated by two others - the Pacific Ocean perch (S. alutus) and the silvergray rockfish (S. brevispinis). Significantly, the chilipepper and the Pacific Ocean perch are morphological and, probably, ecological equivalents, as are the bocaccio and silvergray rockfish. Adams stresses that the similarities between north-south equivalent indicate they may respond similarly to the same management strategies. If so, where one species has been the subject of intensive study, as is true of the Pacific Ocean perch (particularly in foreign fisheries), the findings may be applicable to some degree to an ecological equivalent, in this case the chilipepper.

Echeverria is examining the possibility that growth patterns which differ with sex in rockfishes are manifestations of differing distributions, age structures, or other life history features important to fisheries. Her study, based on 25 morphometric characters, has involved 80-100 specimens of each of 18 species. Linear regressions were run against standard length to see if any body parts were significantly different (0.05) by length between males and females. Head parts were also regressed against head length to see if head parts actually differed or just appeared to do so when compared to standard length. Growth

The fish body was divided into four functional categories: defense (fin spines), swimming (fin rays), reproduction, and feeding (head parts). Males tended to have larger defensive structures, longer fin rays and larger heads with big eyes and large mouths. Secondary sex characters between male and female showed no apparent differences except females were usually deeper bodied ventrally. Head parts regressed against head length showed males with larger heads usually had larger eyes and mouths, but in S. jordani head parts were equivalent and female bodies were longer.

Increased ventral depth in females could relate to their mode of reproduction and the need to accommodate thousands of eggs and developing embryos for a few months. Males tend to have shorter bodies than females and perhaps in order to coexist with a larger female their other body parts help compensate for their smaller size. The existence of larger eyes and mouths could aid in feeding efficiency and the larger fin rays function in maneuverability and speed. For a full evaluation of the functional significance of the dimorphic features a more thorough knowledge of the behavior and associations of each species is necessary.

Alaskan Fish Communities Compared to Fish Communities at Lower Latitudes

Certain features of the nearshore fish communities in southern Alaska, when compared to corresponding features in tropical and warm-temperate communities, provide insight into how community structure differs with latitude. This was the finding of Dr. Edmund Hobson, Investigation Leader at the Tiburon Laboratory, during recent studies on the research vessel, Murre II, of the Auke Bay Fisheries Laboratory. Species diversity and numbers of fish proved much lower on the northern reefs when compared to earlier studies using the same methods in southern California (latitude about 33° N) and Hawaii (latitude about 19° N). Thus the finding continued a trend, noted in comparing the southern Californian and Hawaiian faunas. The mean number of species on 10 transects (25 x 4 m) in Alaska was only 3.9, compared to 12 on 26 transects in southern California (1972-1975) and 30 on 11 transects in Hawaii (1977). Total number of species on all transects at each location followed the same pattern: 10 species in Alaska, 38 species in southern California, and 85 species in Hawaii. Mean number of individuals also decreased with latitude: Alaska 7.1, southern California 100, and Hawaii 218. These figures are not meant to imply there is more life at lower latitudes, only that the fish communities are structured differently. Other components of the nearshore ecosystem, which are under study, have patterns of diversity and number with latitude which are the reverse of that in the fishes.

The increased vulnerability of smaller fishes to predators during twilight has been a major element in Dr. Hobson's on-going studies of predator-prey relations. Therefore, the protracted twilight in the Alaskan latitudes is of particular interest to him. Preliminary

study of the sand lance, Ammodytes hexapterus, a major prey of many species important to fishermen, indicates it is severely pressured by predators for more than 3 hours as it shifts from a daytime mode in the water column to a nocturnal mode buried in the sediments. This compares to a corresponding period of less than one hour when predators severely threaten major prey fish in tropical waters.

Manuscript Describes Fishery Potential of the Shortbelly Rockfish

The shortbelly rockfish, Sebastes jordani, represents a large, but unfished resource in waters off northern California. This is the conclusion reached in a manuscript prepared by Dr. William Lenarz, Leader of the Rockfish Analysis Task at the Tiburon Laboratory.

Preparation of the manuscript was prompted by interest shown by both fishers and processors in developing a fishery for shortbelly rockfish. The paper summarizes information on the species and draws heavily from data collected by the rockfish survey conducted off the west coast during 1977. More specifically the paper 1) describes the biology of the species, 2) makes first approximations of the reaction of the stock(s) to various levels of fishing, 3) reviews the rockfish survey results with regard to logistics of fishing, 4) reviews potential of development of a fishery, and 5) discusses management options for the fishery. Segments of the paper will be presented at a meeting on the rockfish survey in Seattle, July 6-7. Lenarz intends to submit the paper for publication in the NMFS Marine Fisheries Review.

FISHERIES DEVELOPMENT INVESTIGATIONS

Recreational Fisheries Improvement

Work continues on rearing and release of salmon. Roger Green, Leader of the Recreational Fisheries Improvement Program at the Tiburon Laboratory, reports that 18 tags were returned from the 1976 release of king salmon this month, bringing the total number of returns from that group to 78. This gives a tag recovery rate of 3% so far, indicating a return to the fishery of 13% when corrected for tag shedding/mortality at sea. Also, one more tag was received from the 1975 release of coho salmon.

The San Francisco Tyee Club obtained an additional 100,000 king salmon for the Tiburon Laboratory from the Department of Fish and Game. Fifty thousand of these are nose-tagged and are now being subjected to artificial chemical imprinting.

The remainder of the last group of kings, about 25,000 fish, was released this month. About 80% of these are nose-tagged. Last month's estimate of mortalities was too high.

The delivery of coho salmon smolts being raised for the program at Rochester, Washington has been delayed 4 weeks while a virus check is being done for the California state import permit.

Changes in California Angling Methods and Gear Documented

In June, Ms. Susan Smith, Fishery Biologist, completed the manuscript, "Changes in salt water angling equipment and methods in California," and copies were sent out to reviewers. The report traces developments in salt water angling gear from before the turn of the century to the present time, and gives examples of selected California fisheries that have been affected by changes in methods and gear. One purpose of the report is to point out that such factors as angler efficiency, which may be altered when there is a change in methods or tackle, should be considered when biologists estimate relative abundance of marine game fish populations using effort units.

PHYSIOLOGY INVESTIGATIONS

Striped Bass Studies Involve Field Collections and Laboratory Experiments

The striped bass experimental season, which began in early April, ended in June. Dr. J. Whipple, Investigation Leader, reported that studies involved field collection and laboratory experiments designed to test the relative contribution that inherent and environmental factors contribute to striped bass egg and larval mortality.

Food: In the two completed larval experiments the relation of food ration to larval survival and development was examined from a bioenergetic viewpoint. This approach required that factors associated with larval food and feeding be examined. These included feeding rates, digestion rates, points-of-no-return, assimilation rates, and oxygen consumption. This information will allow determination of energy utilization and expenditure rates for different levels of development and survival. The object is to determine the amount of energy needed (from internal or external sources) for various developmental and survival rates. Samples are presently being analyzed and results summarized.

Survival results from three experiments conducted the last 2 years showed two periods of high mortality in larvae fed different food rations. The first period occurred 2 days prior to the onset of feeding, 5 days after hatching. This mortality averaged 15%. The second period began 18-21 days after hatching and mortality either continued to decline until the experiment ended (31 days after fertilization) or it stabilized within 5-7 days. Survival directly correlated with food ration and ranged from 28% for 0.01 food organisms (Artemia)/ml to 87% for 5.00 organisms/ml.

Ions: Previous experiments (1977) indicated an effect of differing ionic compositions of culture water on survival of striped bass from spawning to hatching. In water with poorest survival (e.g. hatchery) iron concentration was very low.

Three experiments testing the effect of various treatments of iron and EDTA on survival of striped bass from spawning through fertilization and hatching were completed. The addition of EDTA was to prevent the precipitation of iron, making it more available to eggs and embryos.

Water samples from the various treatments are being analyzed by the U.S. Bureau of Reclamation Water Quality Laboratory. Water samples from spawning areas in the Delta are also being analyzed. Analyses include: Potassium, sodium, magnesium, calcium, silicates, copper, iron, chloride, carbonate, bicarbonate, alkalinity, sulfates, specific conductance, pH, hardness, TDS, cadmium, chromium, lead manganese, zinc, mercury, cyanide, nitrogen, ammonia, ammonia and total organics, nitrites, nitrates, and phosphates. Samples of gonadal eggs were also taken for iron analysis.

Data analyses are presently incomplete. However, preliminary results indicate that the addition of iron enhances fertilization and chorionic membrane hardening, while the addition of EDTA alone enhances survival from fertilization to hatching. Iron appears to be important in survival to hatching, but other ion(s) may also be involved. The addition of a chelator (EDTA) in laboratory and hatchery waters appears to increase survival significantly.

Inherent Factors: Results from a large sample of adult striped bass taken before, during and after spawning are being coded for computer analysis. The variability in gonadal eggs has not been completely assessed, but autopsies indicate that the viability of the eggs may be highly variable. Preliminary results also show that spawning evidently results in considerable stress in females as indicated by the poor condition of spent females. Spent females are heavily parasitized and exhibit other indications of stress.

Final Report in Preparation on OCSEAP Contract Research

A final report is being prepared for the OCSEAP reimbursable contract research. Data are being coded, card-punched and analyzed. Seven manuscripts are in preparation for publication including the final manuscript for publication in the Proceedings of the Conference on Assessment of Ecological Impacts of Oil Spills, entitled "Effects of petroleum hydrocarbons on gonadal maturation in the starry flounder (Platichthys stellatus (Pallas)), " by Jeannette A. Whipple, Thomas G. Yocum, D. Ross Smart, and Meryl Cohen. This paper was presented by Dr. Whipple at the conference on June 17; the meeting was also attended by the co-authors.

Results presented in the paper include photographs of histological effects on low chronic concentrations of the water-soluble fraction of crude oil on eggs during maturation. Such effects include abnormal formation of vacuoles in eggs and the death of gonadal eggs prior to spawning, resulting in reduced fecundity. Effects were also seen in the abnormal stimulation of maturation in exposed females and males.

PUBLIC AFFAIRS

- June 2 - Lt. Wayne Perryman, NOAA Corps, presented a talk at Orange Coast Community College to students taking a field biology course. Peryyman's presentation included a brief history of the porpoise/tuna problem and emphasized present and future research efforts.

A program honoring Pan-Asian Americans, their art, culture and history was held on June 22 at the Southwest Fisheries Center. San Diego county representatives from the Union of Pan-Asian Communities, the Council of Filipino-American Organizations and the Indochinese Assistance project took part. Shown in the photograph are Pedro Paloma, Fishery Biologist at the La Jolla Laboratory who organized the event, Virginia Fung, Administrative Assistant, Union of Pan-Asian Communities (UPAC), Dr. George Castillo, Personnel Specialist for Operation SAMAHAN ("Working Together"), a social service project of the Council of Filipino-American Organizations (COPAO), and Phuc Manh Tran, Coordinator for the Indochinese Assistance Project.



HONORS AND AWARDS

This month the National Association of Government Communicators presented a "Blue Pencil Award" for outstanding government publications produced in 1977 to James Squire and Susan Smith for their authorship of the "Anglers' Guide to the United States Pacific Coast." The Guide was awarded third place in the Technical Publications division.

Award Ceremony Held at Center

At a ceremony in the auditorium of the Southwest Fisheries Center on June 30, the Center Director, Izadore Barrett presented awards to the following staff members: Receiving Quality Step Increases were--Robert Butler, Computer Programmer, Al Coan, Mathematician, Jacqueline Jennings, Fred Kellenberger, Data Systems Manager. Kathy Senini, Data Transcriber, received a Cash Award.

Dan Huppert and Jane Mc Millan, Economists, Fishery Biologist Gary Stauffer and Keith Parker, Statistician were recognized for their contributions to the Anchovy Management Plan by presentation of a Group Cash Award. Barrett noted that although Alec Mac Call, Marine Biologist could not be included in this award since he is an employee of the California Department of Fish and Game, he has suggested to the State that Mac Call be recognized similarly for his role in formulating the Anchovy Management Plan. The Plan has received wide name and has been put forward as an excellent example for similar plans trhoughout the nation.

Shown from left to right in the accompanying photograph are some of the award winners. In the first row are: Senini, Huppert, and Jennings. In the back row are: Kellenberger, Butler, Parker, and Stauffer.



- May 21 - Munoz, Antonio, Cash Award - Tiburon Laboratory
- Giguere, Walburga, Administrative Officer, Quality
 Step Increase - Tiburon Laboratory

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At a general staff meeting at the Honolulu Laboratory, Center Director Barrett presented the following awards:

Special Achievement

Michael Adams
Sally Kuba
Hazel Nishimura
Ray Sumida (not present)
Irene Toyomura
Lucille Tsukano
James Uchiyama

Quality Step Increase

Roy Mendelssohn
Richard Uchida (not present)
Marian Yong (not present)
Elizabeth Young

Receiving Length of Service awards this month were the following:
From the Honolulu Laboratory: Joseph Arakawa, 20 years; James Uchiyama, 15 years; from the Tiburon Laboratory; Ted Hobson, 20 years; from PEG, Douglas Mc Lain, 15 years service; from the La Jolla Laboratory; John Mac Gregor, 30 years; Larry Eber, 25 years; Reuben Lasker, 20 years; and William Perrin and James Zweifel, each 15 years service.

VISITORS

Honolulu Laboratory

- June 13 - Dr. R.T. Yang, Institute of Oceanography, National Taiwan University, Taipei, Republic of China, spent more time with Mr. Shomura. Dr. Yang was en route home from the Suva meeting.
- Mr. Thomas Cooney, Hawaii Institute of Marine Biology, University of Hawaii, discussed his proposal on the NWHI offshore pelagic nehu project with Mr. Shomura.
- June 15 - Mr. Dan Popper, UNDP, visited Mr. Shomura.
- 16 - Ms. Laura Westbrook and Mr. Alan Okamoto, MOP, University of Hawaii, visited Mr. Uchiyama to discuss the MOP program.

- 19 - Dr. Toshio Okuhara, Professor of International Law, Kokushikan University, Tokyo, Japan, visited Mr. Shomura to discuss a variety of matters such as HL's ongoing research and the 200-mile FCZ.
- 20 - Mr. "Drum" Inouye and his son, Mr. Jed Inouye, discussed the NWHI spiny lobster fishery with Mr. Hida.
- 22-23 - Messrs. Soemarto (Academy of Fisheries Institute), Subagyo Tarunoatmodjo (Marine Fisheries Training, Tegal), Mat Siin Asan (Marine Fisheries Training, Marcado), Achmod Dahlan (Belawan, Nont--Sumatra) and Bambang Edi Priyono (Marine Fisheries Training, Ambon), visitors from Indonesia, met briefly with Mr. Shomura on June 22 and were taken on a tour of the Hawaii State Fish and Game's Anuenue Fisheries Research Center by Mr. Yuen. On June 23 they were given a tour of the fish auction and fresh fish markets by Mr. Humphreys before they departed for Seattle, Washington.
- 29 - Mr. Shomura was visited by George Liao, Office of the Assistant Administrator for Policy and Planning, NOAA, Washington, D.C.

PEG

- June 1 - Dr. R. M. Laurs, SWFC, La Jolla, California
 - Ron Lynn, SWFC, La Jolla, California
 - Pat Livingston, NWAFC, Seattle, Washington
- 9 - Dr. Morris Schulkin, Applied Physics Lab, University of Washington, Potomac, Maryland
- 15-16 - John Carr, SWFC, La Jolla, California
- 19 - Dr. Felix Favorite, NWAFC, Seattle, Washington

La Jolla Laboratory

- June 5 - La Marr Trott, Fisheries Assessment Division, NMFS, Washington, D. C.
- 6 - Richard Heimann, CF&G, Menlo Park at the Center to meet with David Mackett, Center Planning Officer, for discussions on the State/Federal agreement for data, statistics and information exchange.

- June 12 - Gerry Howard, Gary Smith and Howard Ness, NMFS Southwest Region met with Center Director Barrett, Charlie Fullerton and Mel Odemar, California Department of Fish and Game at the Center for discussions on State/Federal matters, particularly data exchange and requirements for confidentiality and general working arrangements among all concerned.
- Fred Ganjon and Steven Forman, NOAA, Office of Programs and Budget/ were at the Center to review activities in the Oceanic Division.
- 14 - Dr. Jose Maria Caldeira de Sousa Guimaraes, Economic Adviser to the President of the Republic of Portugal. Dr. Guimaraes was invited to the U.S. by the International Communication Agency. He was accompanied by Joseph McGovern, Department of State Escort/Interpreter.
- 15 - Candace Turner, NASO Personnel, NOAA, Seattle; Charles K. Townsend, National Ocean Survey, who is Deputy Director, Pacific Marine Center; Charles R. Hitz, Fisheries Liaison, National Ocean Survey, Pacific Marine Center, Seattle, Washington for debriefing on David Starr Jordan use and activities for the past year.
- 15 - Kim Holland, University of Pennsylvania, Philadelphia
- John Proni, NOAA, Environmental Research Laboratory, Miami, Florida.
- 19 - Walter Ikehara, University of Hawaii, Hawaii Institute of Marine Biology, Kaneohe, Hawaii.
- June 22 - Dr. Leo Berner, Jr., Texas A&M University, College Station, Texas
- 28 - David Steller, Earth Science Consulting and Technology Corporation, Costa Mesa, was at the Center to participate in the Small Satellite Workshop. Later, Steller met with interested members of the Coastal and Oceanic Fisheries Divisions for round-table discussions on recent advances in the use of satellite technology for environmental analysis.
- William A. Sprigg, NOAA, Rockville, Maryland.

Tiburon Laboratory

- June 5 - Msgr. Felipe Riaz, Philippine Mission, Pampanga, Philippines
- 14 - Fred Kellenberger, SWFC, La Jolla, California
- 17 - Joe Valencic, Saddleback College, Mission Viejo, California
- 20 - Roger Morris, NOAA, NOS, Sausalito, California

- June 20 - Louise Teather, Belvedere-Tiburon Landmarks Society,
Tiburon, California
- 21 - Darlene Osborne, California Department of Fish and Game,
Sacramento, California
- 22 - Michael Richardson, Int. Seafood, Hayward, California
- Ted Caster, Int. Seafood, Hayward, California
- Guy M. Duggan, Author: "Shaping Up to Ship Out,"
Tiburon, California
- 28 - Peter Calimeris, NMFS, La Jolla, California

SEMINARS

La Jolla Laboratory

- June 5 - Dr. Bertil Ostrom, Hydrographic Department, National
Board of Fisheries, Sweden discussed, "Some remote
sensing applications to marine research and fisheries
in Sweden."
- 19 - Alex Wild, Inter-American Tropical Tuna Commission,
presented a talk on, "Yellowfin and skipjack otolith
increment validation studies."
- 27 - NOAA's Commissioned Officer Corps presented a film,
"The Seventh Service." This award-winning film depicts
the role of NOAA's Commissioned Officer Corps within
the U.S. Department of Commerce.

MEETINGS AND TRAVEL

- May 30 -
- June 2 - F. Kellenberger, Data Systems Manager, SW Region,
traveled to Washington, D.C. to meet with NMFS and Office
of Information Services personnel on foreign fishing
enforcement system.
- May 31 -
- June 1 - M. Laurs and R. Lynn, La Jolla Laboratory, traveled to
Monterey to meet with PEG personnel concerning data
summaries for inputs in albacore migration model.
- May 30 -
- June 8 - J. Butler, Fishery Biologist at the La Jolla Laboratory
attended the meetings of the American Society of Ichthy-
ologists and Herpetologists in Tempe, Arizona where he
delivered a talk on the early life history of two species
of Nansenia (Argentinidae).

- June 1 - Richard Shomura, Honolulu Laboratory Director, returned from the Center Management Meeting in La Jolla.
- 2 - Shomura departed for Suva, Fiji, as a member of the U.S. delegation to discuss the creation of a South Pacific Fisheries Agency; he returned on June 10.
- 4-8 - Center Director Barrett in Washington, D.C. to attend a bilateral meeting with Mexico and to meet with key Washington office staff.
- 5-7 - Dr. William Lenarz and Ed Ueber of Tiburon traveled to Eureka for a meeting of the Groundfish Management Plan Development Team.
- 6 - Richard Heimann, CF&G, Menlo Park at the Center to meet with David Mackett, Center Planning Officer, for discussions on the State/Federal agreement for data, statistics and information exchange.
- N. Bartoo, J. Caruso, A. Coan, R. Holt, N. Lo, J. MacGregor, K. Parker, J. Powers, R. Rinaldo, G. Sakagawa, P. Smith, J. Squire, G. Stauffer, B. Wahlen and E. Weber all attended American Institute of Fishery Research Biologists Stock Abundance Estimation Workshop at San Clemente.
- 6-7 - Susan E. Smith and Maureen Woods of Tiburon attended the 2nd NMFS Publications Seminar, held in Seattle, Washington.
- F. Kellenberger, Data Systems Manager, in Long Beach to attend an Enforcement System Design meeting.
- 7-8 - J. Carr, Deputy Director, in Washington, D.C. to meet with key Washington office staff personnel.
- 7-9 - Dr. D. Huppert, La Jolla Laboratory, traveled to Arcata, California to attend the Scientific and Statistical Committee and the Pacific Fishery Management Council meetings.
- 12 - Dr. D. King, Economist, La Jolla Laboratory, traveled to Los Angeles to collect data related to the tuna industry at the Federal Trade Commission.
- 12-15 - Dr. D. Huppert, Economist, La Jolla Laboratory, traveled to Washington, D.C. to confer with Washington personnel in formulating a multi-part survey form. Since there is a quota in NOAA on the number of survey proposals which may be submitted to the Office of Management and Budget, it was necessary to develop an overall socio-economic survey format with particular subsections to accommodate a variety of needs.

- June 13 - With Dr. W. Fox, Center Director Barrett attended the Inter-American Tropical Tuna Commission delegation meeting at the Center.
- 13-14 - Shomura sat in on portions of the Sea Grant Site Review Team visit at the University of Hawaii.
- Al Milliken of the Washington Department of Fisheries, Lenarz and Ueber met at the Tiburon Laboratory to work on the draft of the Groundfish Management Plan.
- 13-14 - Dr. Reuben Lasker, La Jolla Laboratory, attended Ocean Science Board meetings held at Scripps Institution of Oceanography.
- 15-16 - Dr. Lasker attended a workshop sponsored by the Environmental Research Laboratory in Seattle, Washington.
- 14-17 - Dr. Jeannette Whipple, Tiburon Laboratory, attended and presented a paper at the AIBS Conference on Assessment of Ecological Impacts of Oil Spills at Keystone, Colorado.
- 15 - Ueber, Tiburon Laboratory, attended a meeting in San Francisco called by Sam Bleicher, Director of the Office of Ocean Management, NMFS, to discuss a marine sanctuaries program with members of the commercial fishing industry.
- F. Kellenberger, Data Systems Manager was in Terminal Island to meet with Southwest Region and CF&G personnel on the Fish Landings and Vessel Operating Unit.
- 15-16 - Deputy Director Carr traveled to Monterey to consult with PEG staff on their activities.
- 18-22 - Attending the national meeting of the American Society of Limnology and Oceanography in Victoria, B.C., Canada were: Drs. M. Laurs, R. Lasker and R. Owens, all of the La Jolla Laboratory.
- 19-22 - F. Kellenberger in Seattle, Washington to attend a National Data Management Committee meeting.
- 20 - Shomura and Yuen, and Drs. Adams, Mendelssohn, Skillman and Wetherall met with Wilvan Van Campen, Executive Director of the Western Pacific Regional Fishery Management Council (WPRFMC), to review recreational fisheries data.
- 26 - Shomura attended the change of command ceremony at the 14th Coast Guard District Sand Island Base. RAdm. David P. Lauth relieved RAdm James W. Moreau as the local Commander.

- June 26-27 - Dr. Richard Parrish and Ms. Donna Mallincoate, PEG, traveled to Long Beach, California to discuss the acquisition of sportfish data from California Department of Fish and Game.
- 26-28 - Dr. D. King, La Jolla Laboratory, was in Los Angeles to collect economic information from the Customs Office, International Tariff Commission and Federal Trade Commission.
- 27-28 - Shomura, Center Director Barrett, and Drs. Adams and Mendelssohn attended the 8th Scientific and Statistical Committee (WPRFMC) meeting at the King Kamehameha Hotel in Kona, Hawaii.
- June 27 -
July 3 - Dr. Fox traveled to San Jose, Costa Rica to participate in a meeting on renegotiating sections of the International Commission for the Conservation of Atlantic Tunas (ICCAT).
- June 29 -
July 1 - Program and Planning Officer David Mackett in Baltimore, Maryland to attend a Sea Grant/NMFS Fisheries Development meeting.

PERSONNEL

- May 30 - Ronald Grey, Student Assistant, entered on duty - La Jolla Laboratory.
- Beverly Macewicz, Biological Technician, expiration of Temporary Appointment - La Jolla Laboratory.
- June 1 - Bert S. Kikkawa, Biological Aid (Fisheries), CC/WAE Appointment - Honolulu Laboratory.
- 2 - Stephen V. D. Ralston, Biological Technician (Fisheries), termination of Temporary Appointment - Honolulu Laboratory.
- 12 - Cindy Muncy, Cash and Attendance Clerk, Reassignment - La Jolla Laboratory.
- 15 - Kathleen Dorsey, Biological Technician, Resignation - La Jolla Laboratory.

- June 16 - Nancy Scott, Cash and Attendance Clerk, Resignation - La Jolla Laboratory.
- Rebecca Morrow, Clerk-Typist, Resignation - La Jolla Laboratory.
- 19 - Linda Kadubec, Clerk-Typist, Temporary Appointment - La Jolla Laboratory.
- 23 - John T. Barnes, Biological Technician, Termination - Tiburon Laboratory.
- 26 - Martin Johnson, NOAA Junior Fellow, Appointment - La Jolla Laboratory.

TRAINING

- January-
June 1978 - Susan Smith, Publications Specialist, Tiburon Laboratory, completed two courses, Fishery Biology and Ornithology, given at College of Marin, Kentfield, California.
- January-
June 1978 - Maureen Woods, Librarian, Tiburon Laboratory, completed a course in Fishery Biology, given at College of Marin, Kentfield, California.
- June 15 - James R. Chess, Tiburon Laboratory, CSC, Report Writing.
- June 19-23 - Center Director Barrett was in Ojai, California, to attend the 17th Annual Leadership Laboratory in Human Relations.

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